Asian Nursing Research 5 (2011) 216–221

Contents lists available at SciVerse ScienceDirect

Asian Nursing Research

journal homepage: www.asian-nursingresearch.com

Research Article

Construct Equivalence and Latent Means Analysis of Health Behaviors Between Male and Female Middle School Students

Jeong Mo Park, RN, PhD [1], Ae Kyung Han, RN, PhD [2], Yoon Hee Cho, RN, PhD [2,*]

[1] Department of Nursing, Kyungin Women's College, Incheon, Korea
[2] College of Nursing, Eulji University, Seongnam, Korea

ARTICLE INFO

Article history:
Received 12 July 2011
Received in revised form
22 November 2011
Accepted 25 November 2011

Keywords:
adolescent
health behavior
sex differences

SUMMARY

Purpose: The purpose of this study was to investigate the construct equivalence of the five general factors (subjective health, eating habits, physical activities, sedentary lifestyle, and sleeping behaviors) and to compare the latent means between male and female middle school students in Incheon, Korea.
Methods: The 2008 Korean Youth Risk Behavior Survey data was used for analysis. Multigroup confirmatory factor analysis was performed to test whether the scale has configural, metric, and scalar invariance across gender.
Results: Configural invariance, metric invariance, and factor invariance were satisfied for latent means analysis (LMA) between genders. Male and female students were significantly different in LMA of all factors. Male students reported better subjective health, consumed more fast food and carbonated drinks, participated in more physical activities, showed less sedentary behavior, and enjoyed better quality of sleep than female students.
Conclusion: Health providers should consider gender differences when they develop and deliver health promotion programs aimed at adolescents.

Introduction

Adolescent health behaviors are among the factors that determine health status in adult life, so proper health behaviors should be established during adolescence (Wickman, Anderson, & Greenberg, 2008). Accordingly, many countries have recently begun to regard adolescents as the new target group of the health promotion projects to improve people's health and reduce medical costs. Therefore, periodic national surveys and analysis of adolescents' health behaviors can be an essential step in a country's ongoing health promotion efforts (Centers for Disease Control and Prevention, 2011).

Centers of Disease Control and Prevention developed the Youth Risk Behavior Surveillance System to identify the health risk behaviors of adolescents in 1989. State educational institutions and health institutions have conducted the Youth Risk Behavior Survey periodically in the United States. Korea Centers for Disease Control and Prevention (KCDC) has had an online Youth Risk Behavior Survey (KYRBS) since 2005, and conducted the fourth survey using a tool consisting of 131 questions about health behaviors in 2008 (KCDC, 2010). Although Korea started conducting national surveys later than other developed countries, annual accumulated data would be used as the basis for health promotion of young people in the future. The purposes of the KYRBS are to gather data about the health behaviors of Korean adolescents, to use that data to guide future youth health promotion efforts, and to compare Korean adolescents' health behaviors with those of adolescents in other countries. The KYRBS is currently composed of 14 categories, including smoking, drinking, obesity and weight control, physical activities, eating habits, and injury prevention, among others (KCDC, 2010).

Before the KCDC's online survey, a considerable number of studies on the health risk behaviors of young people had been conducted, but the studies were individual and sporadic. The characteristics of the health behaviors of Korean adolescents were therefore difficult to identify in a straightforward manner, although some conclusions could be drawn. Many researchers reported that the rates of smoking and drinking in adolescents were not low when compared with rates in adults (Ko et al., 2006; J. H. Lee, 2008; M. S. Lee, 2006; Ministry of Health and Welfare & KCDC, 2007). According to the third Korean national health and nutrition examination survey, the average age at which adolescents tried smoking was 13.5 years; 16.9% of adolescents drank monthly, and 62.1% of adolescent drinkers were excessive drinkers (Ministry of

* Correspondence to: Yoon Hee Cho, RN, PhD, College of Nursing, Eulji University, 212 Yangi-dong, Sujeong-gu, Seongnam-si, Gyeonggi-do, 461-713, Korea.
E-mail address: c7y6h@eulji.ac.kr (Y.H. Cho).

1976-1317/$ – see front matter
doi:10.1016/j.anr.2011.12.002

Health and Welfare & KCDC). Correspondingly, studies have pointed to an early and integrated education on good health behaviors because health behaviors of adolescents assist as a determinant of other health behaviors (D. S. Kim & H. S. Kim, 2010; Ko et al., 2006; J. H. Lee, 2008). However, studies on health risk behaviors other than smoking and drinking are relatively lacking. As such, studies examining a greater range of health promotion behaviors and health risk behaviors of adolescents are required.

Factors affecting the health behaviors of adolescents are diverse. One of the biggest factors seems to be gender. In particular, rates of smoking and drinking differ greatly by gender, and male and female adolescents show different tendencies in both the amount of and reasons for smoking and drinking (M. S. Lee, 2006; Ministry of Health and Welfare & KCDC, 2007; Pitel, Geckova, van Dijk, & Reijneveld, 2010). Additionally, health behaviors including diet, physical activities, perceived health status, and rest have been reported to differ between genders (J. W. Kim et al., 2009; Lai Yeung, 2010; M. S. Lee, 2006; Ministry of Health and Welfare & KCDC, 2007; Pate, Heath, Dowda, & Trost, 1996). According to the results of the fifth KYRBS of KCDC (2009), 28% of male students and 25.9% of female students reported skipping breakfast. Additionally only 18.4% of female students engaged in physical activity more than 3 days per week, compared to 72.5% of male students.

Most variables in the social sciences are defined as latent variables, which cannot be measured directly. However, many studies that analyze the differences between groups, such as genders, have so far shown a high probability of error because of underlying assumptions and the fact that the same measuring tools could be applied to both groups simultaneously, were not verified (Cho, 2007; Hong, Malik, & Lee, 2003). Namely, the construct equivalence implies that respondents from different cultural groups attach the same meaning to the construct as a whole, and can be determined by checking invariance of measurement, meaning that the same attribute must relate to the same set of observations in the same way in each group (Rusticus & Hubley, 2006). The evaluation of construct equivalence as a verification method for measuring tools was proposed in order to reduce the probability of errors of measurements (Hong et al., 2003). Also, *t* test, analysis of variance and multivariate analysis of variance were typically used to test the mean difference between groups, but latent means analysis (LMA) has been recently suggested as an appropriate method to reduce potential errors of interpretation (Cole, Maxwell, Arvey, & Sale, 1993; Hong et al.; J.H. Kim, Kim, & Hong, 2009). The traditional approaches to assessing between-group differences are based on the scores of measured or composite variables rather than latent variables or factors. On the other hand, LMA allows the researcher to test hypotheses involving the latent constructs of interest rather than the measured variables per se. Also, LMA allows researchers to conduct a preliminary assessment of confounding sources of variation prior to evaluating differences between the means, such as between-group differences in the patterns of factor loading (configural variance) or in the strength of association between the measured variables and the latent constructs of interest (metric variance; Hong et al.).

Purpose

The purpose of this study is to investigate the construct equivalence of five scales of the KYRBS and to compare the latent means between male and female students. This study will therefore be able to provide basic data to use in the development of gender-specific health promotion programs for adolescents.

The study used the following hypotheses: Hypothesis 1: The KYRBS will be equally valid for male and female students. This includes (a) The KYRBS will be verified by configural invariance. (b) The KYRBS will be verified by metric invariance. (c) The KYRBS will be verified by scalar invariance. Hypothesis 2: Male and female students will show the difference of latent means in their health behaviors.

Methods

Research design

This study is a secondary data analysis of the Korean Youth Risk Behavior Surveillance (KYRBS) survey, consisting of data collected from a nationally representative sample of high school students.

Participants

The participants of this study were middle school students living in Incheon City who participated in online surveys of 2008 Adolescent Health Behavior. The results of this study will be used as a basis for development health promotion programs and policies based on a particular community. Thus, middle school students who live in Incheon were selected as a primary target population for future policy development. In this study, raw data which is already removed school information of students, logical errors and outliers from KCDC was used, so there was no missing data. The total number of students used in this study was 2,798 (1,281 boys, 1,517 girls).

Procedures

In this study, the KYRBS raw data was used. This data was received after review by the research institution of the study's purpose and plans for using the data according to the regulation about opening and application of KYRBSW raw data. The date that authors received permission for use of KYRBS raw data from KCDC was July 31, 2010.

The KYRBS was performed under approval from the government (Approval Number 11758). Study participants filled out online questionnaires under the condition of anonymity. The KYRBS consists of the following 14 categories: smoking, drinking, obesity and weight control, physical activities, eating habits, injury prevention, drugs, sexual behaviors, mental health, oral health, hygiene, health equity, perceived health status, and internet addiction (KCDC, 2010).

Measures

Four of the 14 categories of KYRBS were selected in this study—3 questions on the perceived health status (perceived health status, perceived happiness status, and perceived body image), 10 questions on the eating habits (frequency of breakfast and lunch, frequency of vegetables and fruits intake, consumption of carbonated drinks, fast food, milk, and instant noodles in the last 7 days, etc.), 7 questions on the physical activities (number of strenuous physical activities, moderate physical activities, and strengthening exercises in the last 7 days, time spent watching TV and time using a computer for internet, games, etc.), and 3 questions on mental health (hours of sleep, feeling of sound sleep, and perceived stress level). So these questions were used after regrouping through factor analysis.

Principal component analysis with varimax rotation produced 5 factors and 13 items (eigen value $\geq$1). The five factors were subjective health, eating habits, physical activities, sedentary lifestyle, and sleeping behaviors. Subjective health included perceived health status, perceived happiness status, and perceived stress level; eating habits included consumption of carbonated drinks,

Table 1
General Characteristics ($N = 2,798$).

Characteristics	Category	n (%)
Grade	First	945 (33.8)
	Second	933 (33.3)
	Third	920 (32.9)
Age	12	361 (13.0)
	13	933 (33.6)
	14	924 (33.3)
	≥15	559 (20.1)
Economic level	High	208 (7.4)
	Middle high	691 (24.7)
	Middle	1323 (47.3)
	Middle low	435 (15.6)
	Low	141 (5.0)
Living with parents	With parents	2,341 (86.3)
	With father or mother	310 (11.4)
	No parents	62 (2.3)
Education level of mother	Below middle school	104 (4.0)
	High school	1,300 (49.6)
	Graduate college	721 (27.5)
	Do not know	497 (18.9)
Education level of father	Below middle school	132 (5.1)
	High school	1,012 (38.8)
	Graduate college	989 (37.9)
	Do not know	475 (18.2)
Academic achievement	High	379 (13.5)
	Middle high	643 (23.0)
	Middle	728 (26.0)
	Middle low	702 (25.1)
	Low	346 (12.4)

fast food, and instant noodles in the last 7 days; physical activities included the number of strenuous physical activities, moderate physical activities, and strengthening exercises in the last 7 days; sedentary lifestyle included time spent watching TV and time using a computer for internet, games and so on; and sleeping habits included hours of sleep and feeling of sound sleep. Individual item correlations with total scores were $r = .44–.80$, which explained 63.51% of the total variances. The Cronbach's alpha was as follows: subjective health, = .64; eating habits, = .52; physical activities, = .72; sedentary lifestyle, = .75; and sleeping behaviors, = .53.

Data analyses

The Cronbach's alpha test and exploratory factor analysis were conducted to verify reliability and validity. Descriptive analysis was then used to identify the characteristics of the participants;Pearson correlation was used to check the relationship among the variables. The research model fit was tested through structural equation modeling. Because the guidelines of normality (skew <2, kurtosis <7) of all the variables were met (West, Finch, & Curran, 1995, pp. 56–75), structural equation modeling with maximum likelihood estimation was used to estimate the model. The adequacy of model fit was assessed by the chi-square test statistic, together with the goodness of fit index, Turker-Lewis index (TLI), Comparative Fit Index (CFI), Normed Fit Index (NFI), and the root mean squared error of approximation (RMSEA). Also, LMA using structural equation modeling was performed to study gender differences in health behaviors. A two-sided $p < .05$ indicated statistical significance. For data analysis, SPSS 12.0 software (SPSS Inc., Chicago, IL, USA) and AMOS 7.0 (SPSS Inc., Chicago, IL, USA) were employed.

Results

Fitness test of the model and construct validity test

The model was an acceptable fit (χ^2 [$df = 55$, $N = 2,798$] = 237.627, $p < .001$, TLI = .956, CFI = .969, NFI = .960, RMSEA = .034). The results to analyze separately for male and female students were also acceptable fits, and were as follows: Male students (χ^2 [$df = 55$, $n = 1,281$] = 178.094, $p < .001$, TLI = .941, CFI = .958, NFI = .941, RMSEA = .038) and female students (χ^2 [$df = 55$, $n = 1,517$] = 100.625, $p < .001$, TLI = .976, CFI = .983, NFI = .963, RMSEA = .025). In other words, TLI, CFI, and NFI were more than .9 (Vandenberg & Lance, 2000) and RMSEA was less than .05 (Browne & Cudeck, 1993, pp. 136–161).

Convergent validity is the degree to which an operationalization is similar to other operationalizations that it theoretically should also be similar to. That is to say, it means the degree of correlation between two or more of the tools of measuring a single latent variable. How to test the convergent validity is construct reliability and average variance extracted (AVE). Generally, if construct reliability is more than .7 (Hair, Anderson, Tatham, & Black, 1998) and AVE (Fornell & Larcker, 1981) is more than .5, then convergent validity is appropriate. In this study, construct reliability was .528–.702, and AVE was .283–.463, so convergent validity was not acceptable.

Discriminant validity describes the degree to which the operationalization is not similar to other operationalizations that it theoretically should not be similar to. If ∅ ± two standard errors (2 × SE) was not 1 (95% CI), Anderson and Gebing (1988) described that discriminant validity was appropriate when determining whether to reject the null hypothesis that two or more concepts are the same (correlation coefficient, ∅ = 1.0). In this study, the estimates were −.041 to .129, so discriminant validity was acceptable.

General characteristics of participants

The age of participants ranged from 12 to 15 years, while the distribution among grade levels was similar (first, 33.8%; second, 33.3%; third, 32.9%). A total of 54.2% of the students were male, and 26.0% had moderate academic achievements. For economic level, 47.3% reported middle income status, and 86.3% lived with parents, for the educational level of parents, 38.8% of fathers had completed high school and 49.6% of mothers had completed high school (Table 1).

Correlation between variables

Table 2 presents the correlation coefficients between variables in male and female students. In male middle school students,

Table 2
Correlation Matrix (Boys $n = 1,517$, Girls $n = 1,281$).

Variables	Subjective health r (p)	Eating health r (p)	Physical activities r (p)	Sedentary lifestyle r (p)	Sleep behaviors r (p)
Subjective health		.062 (.016)	−.163 (< .001)	.134 (< .001)	−.324 (< .001)
Eating health	.095 (.001)		.072 (.005)	.151 (< .001)	−.095 (< .001)
Physical activities	−.102 (< .001)	.061 (.030)		−.074 (.004)	.030 (.250)
Sedentary lifestyle	.142 (< .001)	.103 (<.001)	−.081 (.004)		−.003 (.909)
Sleep behaviors	−.298 (< .001)	−.054 (.021)	.093 (.001)	−.021 (.457)	

Note. Right above of blank is correlation coefficient in boys group, left below is girls group.

subjective health showed significantly positive correlations with eating habits and sedentary lifestyle while it showed negative correlation with physical activities and sleeping behaviors. Eating habits showed significantly positive correlations with physical activities and sedentary lifestyle while they showed negative correlation with sleeping behaviors. There was a statistically significant negative correlation between physical activities and sedentary lifestyle.

In female middle school students, subjective health showed significantly positive correlations with eating habits and sedentary lifestyle while it showed negative correlations with physical activities and sleeping behaviors. Eating habits showed significantly positive correlations with physical activities and sedentary lifestyle while they showed negative correlation with sleeping behaviors. There was a statistically significant negative correlation between physical activities and sedentary lifestyle while physical activities had a positive correlation with sleeping behaviors. The rage of correlation in all variables was −.003 to .151 and less than .8 as a criterion of multicollinearity.

Construct equivalence test

Configural invariance

Having compared all alternative models, a baseline model was determined. The baseline model (Model 1) showed very high fit indices ($\chi^2 = 278.716$, $p < .001$, TLI = .957, CFI = .970, and RMSEA = .023; Table 3).

Metric invariance

To compare metric invariance model (Model 2), which has equal factor coefficient between male students and female students, with Model 1 (configural model), chi-square test results showed no significant difference in model fit between Model 1 and 2 ($\Delta\chi^2 = 13.574$, $\Delta df = 8$). As a result, the measurement tool of the KYRBS used in this study could apply equally to both male students and female students because it had metric invariance and no difference in RMSEA and TLI (Table 3).

Scalar invariance

Because the metric invariance model (Model 2) was supported, the next hypothesis tested scalar invariance. Scalar invariance, which is generally determined by the difference of chi-square between the metric invariance model (Model 2) and the scalar invariance model (Model 3), was rejected. J. H. Kim et al. (2009), however, reported that metric invariance was rejected if model fit examined scalar invariance was not worse than model fit examined metric invariance. Therefore, in this study, scalar invariance of the scalar invariance model (Model 3) was accepted because the difference of the model fit was small considering TLI and RMSEA (Table 4). This means the measurement tool of the KYRBS used in this study could apply equally to both male students and female students, and the mean difference observed could reflect real difference of latent variables.

Table 3
Construct Equivalence Test.

Model	χ^2	*df*	*p*	TLI	RMSEA
Model 1: configural invariance (baseline)	278.716	110	<.001	.957	.023
Model 2: metric invariance	292.290	118	<.001	.957	.023
Model 3: metric & scalar invariance	756.817	131	<.001	.867	.041
Model 4: metric, scalar & factor variance invariance	790.971	136	<.001	.866	.042

Notes. TLI = Turker-Lewis Index; LRMSEA = root mean squared error of approximation.

Table 4
Difference Test for Construct Equivalence.

Model	$\Delta\chi^2$	Δdf	Result
Metric invariance: Model 1 vs. Model 2	13.574	8	Denied
Scalar invariance: Model 2 vs. Model 3	464.58*	13	Accepted
Factor variance invariance: Model 3 vs. Model 4	34.154*	5	Accepted

*$p < .001$.

Latent means analysis by gender

Given the three types of invariance satisfied, LMA was performed to test mean differences on the KYRBS across the two groups. According to LMA where male students are used as the reference group, female students show significantly higher latent mean values than male students do in all factors: subjective health (.389), eating habits (.283), physical activities (.665), sedentary lifestyle (.969), and sleeping behaviors (.204). The health behavior that showed the biggest effect size difference between the two groups was physical activities (1.123), and the next biggest difference was in sedentary lifestyle (0.981). Given the effect size of indecisiveness bigger than the other, the interpretation of the result has to be circumspectly considered (Table 5).

Discussion

This study attempted to investigate construct equivalence of scales for measurement of five health behaviors and compare the latent means between male and female middle school students in Incheon, Korea. It was found that configural invariance, metric invariance, and scalar invariance, indicated that different scores on the scale can be different meaningfully across the groups. This is empirical evidence that the scale of 2008 KYRBS pertaining to the five health behaviors can be used in both groups of male and female students simultaneously. Secondly, five health behaviors between male and female students showed significant differences after adjusting for measurement error.

The female students showed a more negative subjective health status than the male students did. A survey of the health behaviors of youths aged 11, 13 and 15 years conducted in 35 countries, including several European countries, the United States, and Canada, also reported that more girls than boys reported an unhealthy status. In particular, more than 42% of girls of Russia, Ukraine, Lithuania, and Latvia reported they were very unhealthy (World Health Organization [WHO], 2004). These were assumed to be due to the relationship with the cultural awareness of the region. According to the same survey results by the WHO, a positive perception of school life has moreover relevance to life satisfaction and health problems: consequently, so students with a positive perception of school life showed greater levels of life satisfaction, and fewer health problems. Subjective health in this study included questions about both happiness and perceived stress. Accordingly, the results from the female students in this study, being less happy and having higher perceived stress, can mean that female students did not consider their school life positively compared to male

Table 5
Differences Analysis of Latent Mean About Variables.

Latent variables	Boys		Girls		*p*	Effect size	Total *M*
	Latent *M*	*M*	Latent *M*	*M*			
Subjective health	0	2.516	.389	2.740	< .001	0.849	2.620
Eat habit	0	2.349	.283	2.165	< .001	0.890	2.265
Physical activity	0	3.070	.665	2.393	< .001	1.123	2.760
Sedentary lifestyle	0	3.210	.969	3.338	< .001	0.981	3.268
Sleeping	0	3.670	.204	3.403	< .001	0.840	3.548

students. Therefore, efforts to increase satisfaction with the school life of female students are needed to improve their subjective health.

Eating habits was the second variable in this study. Here, male students reported that they consumed more carbonated drinks, fast food, and instant noodles than female students. However, the WHO (2004) reported that there were no gender differences in sugar intake and carbonated drink consumption but there were regional differences. As in the study of national youth by J. W. Kim et al. (2009), there were no differences between genders in terms of eating habits. Therefore, male middle-school students need to be educated about a healthy diet based on the results of this study.

In terms of physical activity, male students engaged in more physical activities than female students did in most countries, and in most age groups (WHO). In addition, gender differences increased with age in this area (WHO). These results are similar to the results pertaining to a sedentary lifestyle (M. S. Lee, 2006; Pate et al., 1996; Wilkoz, Chen, Kennedy, & Rankin, 2010). Pate et al. described that students who engaged in less physical activity tended to smoke more, eat fewer vegetables and fruits, to watch relatively more TV, and to have lower academic achievement. Hence, physical activity is believed to be associated with other health-related behaviors. The findings of this study indicate a need to increase the physical activity level of adolescents so as to improve their health status and school life.

As opposed to physical activity, female students tended to spend more time watching TV and using a computer than male students did. According to a study on sedentary lifestyle of children and adolescents in the United States, nearly half (47%) of the participants exceeded more than 2 hours per day in sedentary behaviors (TV/video, computers, and total screen time) (Sisson et al., 2009). According to Sisson et al. (2009), however, the percentage of boys (49.4%) spending more than 2 hours for sedentary behaviors was higher than girls (45.0%) unlike the results of this study. Also, the percentage of adolescents (12–15 years) spending more than 2 hours for sedentary behaviors was also higher than children (6–11 years) (Sisson et al.). Pate et al. (1996) mentioned that students who engaged in less physical activity tended to watch relatively more TV. Tenório et al. (2010) described that place of residence, time of day attending school, and enrollment in physical education were significantly associated with exposure to sedentary behavior on week days. Therefore, interventions to reduce sedentary hours of middle school students should be provided since childhood and considered along with environmental factors and other behaviors such as physical activities.

Generally, male students were found to have better sleeping behaviors than female students: specifically, boys reported enough time to sleep and higher recovery rates as a result of sleep. These results are similar to those of Kim and Kim (2010), but are different from those of other studies (Carskadon, Wolfson, Acebo, Tzischinsky, & Seifer, 1998; B. S. Lee, Kim, Kim, & Kim, 2000; Shin, Kim, Lee, Ahn, & Joo, 2003). B. S. Lee et al. (2000) reported that there were no differences in the sleeping and rest behaviors between boys and girls, while Carskadon et al. (1998) found that female students tend to have longer nighttime sleep than their male counterparts. Sleep can be used as a current indicator of life satisfaction and health status, as sleep generally reflects perceived stress (Brand et al., 2010). Therefore, an additional analysis of the sleeping behaviors of middle school students is needed to improve their levels of health-related behavior and life satisfaction.

This study attempted to test the difference between male and female students in five health behaviors after removing measurement error. Significant differences were found in the five health behaviors between male and female students. These findings will improve the success rate of health promotion programs because health providers can plan health promotion programs in consideration of gender differences.

This study has several limitations. First, sampling, which was done only in a restricted area, limited the generalizability of the study findings to a broader population. Secondly, the similarity of the sample size of two groups is important in latent means analysis, but this study showed lack of similarity because data of 1,517 boys and 1,281 girls, which was conducted through the local allocation depending on the size of the city, was used. Thirdly, scales measured eating habits and sleeping behaviors had poor Cronbach's alpha values. Future studies for developing new scales for measurement of eating habits and sleeping behaviors and to evaluate validity and reliability of scales developed are required.

Conclusion

The purpose of this study was to investigate the construct equivalence of five scales (subject health, eating habits, physical activities, sedentary lifestyle, and sleeping behaviors) of the KYRBS and to compare the latent means between male and female students. First, configural invariance, metric invariance, and scalar invariance, indicated that different scores on the scale can be meaningfully measured across groups. This is empirical evidence supporting that the same scale for the health behaviors can be applied to both male and female students. Secondly, the five health behaviors between male and female students assessed here showed significant differences after adjusting for measurement error. These findings show that health providers should consider gender differences when they develop and deliver health promotion programs aimed at adolescents.

Conflict of interest

The authors declare no conflict of interest.

References

Anderson, J. C., & Gebing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*, 411–423.

Brand, S., Beck, J., Hatzinger, M., Harbaugh, A., Ruch, W., & Holsboer-Trachsler, E. (2010). Associations between satisfaction with life, burnout-related emotional and physical exhaustion, and sleep complaints. *The World Journal of Biological Psychiatry, 11*, 744–754.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models*. Newbury Park, CA: Sage.

Carskadon, M. A., Wolfson, A. R., Acebo, C., Tzischinsky, O., & Seifer, R. (1998). Adolescent sleep patterns, circadian timing, and sleepiness at a transition to early school days. *Sleep, 21*, 871–881.

Centers for Disease Control and Prevention. (2011). Adolescent and school health. *National initiative to improve adolescent health*. Retrieved March 1, 2011, from http://www.cdc.gov/healthyyouth/adolescenthealth/nationalinitiative/index.htm

Cho, O. Y. (2007). A comparative study of construct equivalence, latent means of sport apparel decision factor between male and female college students. *Korean Journal of Sport Management, 12*, 103–114.

Cole, D. A., Maxwell, S. E., Arvey, R., & Sale, E. (1993). Multivariate group comparisons of variable system; Manova and structural equation modeling. *Psychological Bulletin, 114*, 174–184.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*, 39–50.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis with readings* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Hong, S., Malik, M. L., & Lee, M. K. (2003). Testing configural, metric, scalar and latent mean invariance across gender in sociotropy and autonomy using non-western sample. *Educational and Psychology Measurement, 63*, 636–653.

Kim, D. S., & Kim, H. S. (2010). Early initiation of alcohol drinking, cigarette smoking and sexual intercourse linked to suicidal ideation and attempt. *Yonsei Medical Journal, 51*, 18–26.

Kim, J. H., Kim, M. K., & Hong, S. H. (2009). *Article wrighting with structural equation modeling*. Seoul, Korea: Communication Books.

Kim, J. W., Kong, S. A., Lee, O., Kim, Y. S., Yun, E. H., Kim, S. A., et al. (2009). Patterns and interrelationships for meeting guidelines of physical activity, sedentary,

and dietary behavior in Korean adolescents. *The Korean Journal of Community Living Science, 20*, 413–421.

Ko, Y. K., Yoo, I. Y., Kang, K. H., Lim, J. Y., Kim, M. J., & Yoo, H. J. (2006). Factors related to high-risk health behavior in middle school adolescents. *Journal of Academic Child Health Nursing, 12*, 341–350.

Korea Center of Disease Control. (2010). *The fourth Korea youth risk behavior test*. Seoul: Minister of Health and Welfare.

Korea Center of Disease Control. (2009). *The results of fifth Korea youth risk behavior test*. Retrieved May 10, 2011, from http://yhs.cdc.go.kr/result/statistics05.asp

Lai Yeung, W. L. (2010). Gender perspectives on adolescent eating behaviors: A study on the eating attitudes and behaviors of junior secondary student in Hong Kong. *Journal of Nutrition Education and Behavior, 42*, 250–258.

Lee, B. S., Kim, M. Y., Kim, M. H., & Kim, S. K. (2000). Health belief and performance of health behaviors of some university students in Korea. *Journal of Korean Academy Nursing, 30*, 213–224.

Lee, J. H. (2008). Health risk behaviors of adolescents out of school. Unpublished master's thesis, Sunghynkwan University, Seoul, Korea.

Lee, M. S. (2006). Youth health-related behavior among ninth grade students. *Journal of Korean Society Maternal and Child Health, 10*, 40–57.

Ministry of Health and Welfare, Korea Center of Disease Control. (2007). *The fourth Korea youth risk behavior test*. Seoul: Minister of Health and Welfare.

Pate, R. R., Heath, G. W., Dowda, M., & Trost, S. G. (1996). Associations between physical activity and other health behaviors in a representative sample of United States adolescents. *American Journal of Public Health, 86*, 1577–1581.

Pitel, L., Geckova, A. M., van Dijk, J. P., & Reijneveld, S. A. (2010). Gender differences in adolescent health-related behavior diminished between 1998 and 2006. *Public Health, 124*, 512–518.

Rusticus, S. A., & Hubley, A. M. (2006). Measurement invariance of the multidimensional body-self relations questionnaire: Can we compare across age and gender? *Sex Roles, 55*, 827–842.

Shin, C., Kim, J., Lee, S., Ahn, Y., & Joo, S. (2003). Sleep habits, excessive daytime sleepiness and school performance in high school students. *Psychiatry and Clinical Neurosciences, 57*, 451–453.

Sisson, S. B., Church, T. S., Martin, C. K., Tudor-Locke, C., Smith, S. R., Bouchard, C., et al. (2009). Profiles of sedentary behavior in children and adolescents: The United States national health and nutrition examination survey, 2001–2006. *International Journal of Pediatric Obesity, 4*, 353–359.

Tenório, M. C., Barros, M. V., Tassitano, R. M., Bezerra, J., Tenório, J. M., & Hallal, P. C. (2010). Physical activity and sedentary behavior among adolescent high school students. *Brazilian Journal of Epidemiology, 13*, 105–117.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*, 4–69.

West, S. G., Finch, J. E., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications*. Newbury Park, CA: Sage.

Wickman, M. E., Anderson, N. L., & Greenberg, C. S. (2008). The adolescent perception of invincibility and its influence on teen acceptance of health promotion strategies. *Journal of Pediatric Nursing, 23*, 460–468.

Wilkoz, M. E., Chen, J., Kennedy, C., & Rankin, S. (2010). Gender and ethnic disparities contributing to overweight in California adolescents. *Journal of Public Health, 18*, 131–144.

World Health Organization. (2004). The WHO cross-national study of health behavior in school-aged children from 35 countries: Findings from 2001–2002. *Journal of School Health, 74*, 204–206.